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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 401,

For the Week ending September 8, 1883.

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BORING DEEP WELLS BY WATER PRESSURE.

A new and great advance has been made in sinking deep well pipes, say from 100 to 300 feet or more in depth, in soil that will resist the sinking of the driven well pipe.

The hydraulic pressure system has been successfully applied at Adams, Mass., where six artesian wells are now flowing; one of 187 feet in depth, which was sunk in two hours; five wells of from 100 to 150 feet in depth, one of which has a 10 inch pipe, from which flows 400 gallons per minute under a head of 13 feet above the surface of the ground.

The method of sinking these wells is by the boring power of water under pressure—the pressure being obtained by a steam pump, or in places where a steam pump is not available a hand force pump answers the purpose. A peculiar feature was developed in the experiments made in perfecting this system, and the stern fact brought to light that a stream of water forced into the top of the pipe would keep an opening around the outside of the pipe for a depth of 40 or 50 feet, and would reopen the passage after stopping to put on an additional length of pipe; but after getting down to greater depths the stopping of the flow would allow the sand, gravel, and stones to settle down and wedge the pipe so tight that no available pressure could start it again. In the avoiding of this difficulty consists the novelty of this system. The placing in the line of pipe at every two or three lengths of a three-way cock with the use of two lines of hose gives a perfect control and steadiness of the flow down the pipe during the whole operation.

The hose being attached to the side outlet of the three-way cock, with the plug across the upper outlet until the section of pipe is sunk until the attached hose reaches the ground, when another section is added and another hose is attached to the next three-way cock as before, and the pressure of water put on, when the lower cock is turned so as to shut off the lower hose and continue the stream from the upper hose. In this way a depth of 200 or 300 feet may be attained without difficulty, possibly a much greater depth. A curious property of the power of water in keeping an open passage in an ascending current has been observed in these experiments. A plumb bob upon a line was dropped to a depth of 50 feet upon the outside of one of these pipes while in the process of sinking, and again hauled to the surface, showing that the current maintains a clear space around the outside of the pipe, probably for its whole depth—for in addition to this, the pipe is so loose in the hole that it can be turned around by the hand, and feeds itself down.

The author of this system is Jarvis B. Edson, of North Adams, Mass.

THE POTATO ROT.

At the time of writing, August 23, the daily papers contain telegraphic accounts of the great destruction of the potato crop in various sections of the country. The disease, judging from the descriptions, is doubtless the one known as the "potato rot." This is not a new trouble, and most of the older inhabitants can remember the ravages of this pest in 1842 and again in 1845, when it spread over Great Britain, Ireland, and the United States, causing much distress to those who make the potato the leading article of food.

The rotting of the potatoes is caused by a microscopic fungus, *Peronospora infestans*, which infests the potato plant.

By fungus is understood a plant of a very low order, the more familiar members of which are the toadstools, mushrooms, mildews, and moulds. Some of the fungi live only on decaying organic matter, and are comparatively harmless; in fact, are often helpful in hastening decay and preparing substances for future usefulness. Other species of fungi are parasitic, growing upon living things. The bread mould is a familiar illustration of a small fungus which feeds upon dead matter, while the potato rot fungus is an equally striking example of one thriving upon a living plant. The mildew of the grape, which has caused great damage in many vineyards, is a close relative of the potato rot. They both belong to the same genus (*Peronospora*), a genus which contains a large number of species, and all are destructive to the host plants.

The potato rot fungus consists of long filaments or threads, which grow through the substance of the potato plant, and rob it of juices and induce a rapid decay. The fungus usually makes its first appearance upon the under side of the leaves as frost-like patches, soon causing the foliage to curl and turn brown. This frost-like appearance is due to a multitude of spores which have formed upon the ends of fungus threads protruding from the breathing pores of the leaf. There are many thousand stomata or breathing pores to the square inch, and a dozen or more threads may come out at each opening. Each of these threads forms branches, and each branch bears a spore. This helps to give an idea of the vast number of spores formed upon a single affected leaf. These spores germinate quickly and in a peculiar manner—each spore giving rise to several smaller spores provided with hair-like appendages (*cilia*) by means of which they move quickly around. This is a most admirable provision for the rapid and perfect spreading of the disease when it has once "struck" a potato field.

After the foliage has become affected the disease passes into the stems and down to the tubers, when the most destructive work is done. The farmer should be on the watch for this fatal pest of his potato field. Like most fungi this Peronospora thrives best in warm, rainy, or "muggy" weather. In one of the recent press reports it was stated that the decay was caused by the wet weather which has prevailed in many parts of the country. The weather was only a favoring condition for the growth of the rot plant, as much so as the rains are aids to the profitable development of the various field crops. Weeks ago we predicted, and with a great degree of certainty, that the potatoes would rot in many sections. This came from a knowledge of the nature of the rot and the conditions which favor its development.

It has been shown that the disease is first seen upon the leaves. When the foliage begins to curl and turn brown, the potatoes should be dug at once, and in this prevent the fungus from reaching the tubers. The potatoes should then be placed in a cool and dry place—the conditions least favorable for the further growth of the fungus should it be present. All affected tubers should be thrown out and gathered with the vines and burned. This destroys multitudes of spores which might otherwise live through the winter and be ready to propagate the rot the following season.

There has been a great deal said about "rot proof" varieties of potatoes, but they probably do not exist. Some sorts are more susceptible than others, probably from constitutional weakness. Many prizes have been offered in England for the finding of the best sorts to withstand the attacks of the rot fungus, but without any satisfactory results. Knowing that the disease is caused by a parasitic fungus, the rapid development of which is favored by moist, warm weather, there is little hope of finding a variety of potatoes so abnormal as to be "rot proof."

CHEMISTRY FOR DIGESTION.

In all lands, and in all ages, the instinctive cravings of the human system have demanded and have eventually succeeded in obtaining as an article of food something which should give such a combination of nitrogen, carbon, and hydrogen with oxygen as is not readily accessible in any form of food of natural production. The savage, in temperate or cold climates, may subsist almost exclusively on flesh or fish, and in the tropical regions on vegetables and fruits, as they grow. But it is only the savage who does this. The first elevation from the savage state lifts him above such things and such simplicity of diet. He makes a combination, though without knowing the chemical reasons for it. The combination takes various forms and names, but it serves the same purpose, or aims to do so.

For us the name is *bread*, and no nations can be reckoned who have not been so dependent on that which has been to them what bread is to us, as that it should merit the name we so often give it, "The Staff of Life." And the more advanced the nation has become, the more has their type of bread grown into importance, and the more complete its preparation. The title of "bread winner" given to the supporter of the family but serves to show how absolutely the article is understood to satisfy the wants of the system.

We will not discuss the types as they exist in the present age, here and there throughout the world. Our purpose is a more practical one. It may do us no harm to just give a thought or two to *our* bread; to see what it is that we eat, and how near it comes to being the article which we fondly hope it is, and at any rate to consider what it ought to be, only supposing that human nature was honest.

We are very gravely told that our children should have bread and milk, or its equivalent, as the main article of their diet for the first four to six years after weaning, to the exclusion of almost everything else. Like a great many other of the sagacious plans for bringing up all children on one system by one rule, this may theoretically have some basis in truth. But alas! we are often disappointed. "Things are not what they seem," and while we flatter ourselves that the child is building up its strength and vigor, it is on the contrary only laying the foundation for a lifetime of weakness and suffering because of the very bread on which our hopes were placed. It is an actual fact, as all physicians of skill and experience now recognize, that in most of our families at the present time the *bread* is about the first article which needs watching in cases where weakness of digestion requires the observance of strict regimen in diet.

And it is also true that a very large part of the horrors of dyspepsia, of which we hear so much and from which a fearful proportion of the community are constantly suffering, are due in a great degree to *bread*, that is, to the various forms in which it comes to us, either under its own name or in the guise of its various substitutes—griddle cakes (*ad infinitum*, from buckwheat down—or up), hot biscuit, hot rolls, muffins, waffles, etc., etc. The evils which this array of breakfast diet especially have produced are already telling fearfully on the nation. To find a stomach thoroughly vigorous and perfect in its functions is in most classes and most communities an exception, and the bread supply has really been, and is, responsible for a large part of the evil.

In great measure this sad state of things has sprung from our rapid growth as a nation springing up in the wilderness. This has not only caused the national habit of eating rapidly, but has associated with it the equally widespread habit of preparing the bread food as rapidly, that is, extemporaneously, and consuming it on the instant. We have been taught to consider it scarcely hospitable to set before a guest at the breakfast table *cold* bread. If we cannot give him something *hot* with which to poison himself we apologize, and if the guest is an American he accepts the apology and is sorry for us—and for himself.

The evil result of this has become as truly national as the habit itself. A few words as to the chemistry which the matter of the hot bread involves may serve to set the evil